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ABSTRACT

An early childhood specialist teaching kindergarten classes in a small city in the northeast designed this practicum to improve the science instruction provided kindedrgarten children. Practicum goals were to: (1) increase the effectiveness of the kindergarten science program by providing science experiences based on the recognition of the importance of the active involvement of children in learning activities; (2) develop children's process skills; (3) utilize the natural environment; and (4) stimulate children's inherent curiosity. To achieve these goals, a program of Child Initiated Study was introduced in which children were encouraged to contribute to the science area an item about which they wanted to learn more. Items the children were curious about became the topic of in-depth instruction for a week. Knowledge was shared and hands-on activities were planned that focused on the selected topic. Concurrently, children's process skills were developed through participation in specific activities in three study areas. A Science Open House was organized for parent and child participation. Evaluation data demonstrate the success of the study. Lesson plans are appended. (Author/RH)

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Center for the
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Increasing the Intensity of Science Instruction in the Half-Day Kindergarten

by

Michele Starr
Cluster XXI

PS 017312

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Increasing the Intensity of Science Instruction in the Half-Day Kindergarten

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Cluster XXI

PS 018312

A Practicum I Report Presented to the Ed.D. Program
in Early and Middle Childhood
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Education

NOVA UNIVERSITY

1988

PRACTICUM APPROVAL SHEET

This practicum took place as described.

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September 3, 1987

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This practicum report was submitted by Michele Starr under the direction of the adviser listed below. It was submitted to the Ed.D. Program in Early and Middle Childhood and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Nova University.

Approved:

4-8-88

Date of Final Approval of Report

E. Riley Holman

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ABSTRACT

Increasing the Intensity of Science Instruction in the Half-Day Kindergarten. Starr, Michele A., 1988: Practicum Report, Nova University, Ed.D. Program in Early and Middle Childhood. Descriptors: Kindergarten Children/Early Childhood Education/Preschool Children/Curriculum Development/Science Instruction/Science Education/Science Programs/Science Activities.

This practicum was designed to improve science instruction in kindergarten. The goals were to increase the effectiveness of the kindergarten science program by providing science experiences that recognize the developmental need for children of this age to be actively engaged in the learning process, to develop the children's process skills, to utilize the natural environment, and to stimulate children's inherent curiosity.

The writer introduced Child Initiated Study whereby the children were encouraged to contribute something they wished to learn more about to the science area. Items the children were curious about were chosen for an in-depth weekly topic. Knowledge was shared and hands-on activities were planned focusing on the topic. Concurrently the writer developed children's process skills through participation in specific activities, in three study areas. The writer administered an evaluation component on completing each study area. A Science Open House was developed for parent and child participation.

The results of this practicum were positive. Analysis of the data showed that the emphasis on developing process skills was beneficial to the children involved. The children's natural curiosity was utilized and the natural environment was employed throughout the practicum.

CHAPTER I

INTRODUCTION

Description of Community

This practicum was implemented in the writer's school system. The school is located in a unique small city in the northeast. It is a long, narrow city with proximity to a large metropolitan area. This proximity allows for access to many museums, the theater and concerts, as well as access to different ethnic cultures. The city enjoys an abundance of recreational resources including nine miles of waterfront, beaches, and marinas; 41 parks and playgrounds; 30 tennis courts; four pools; and several lighted sports fields. The city offers extensive leisure time activities for all ages, interests, and seasons. Local radio and cable television stations and a daily newspaper afford the community a superior communication network.

The population of this unique city is approximately 70,000. There is diversity of ethnic and religious affiliations, racial populations, and socioeconomic situations. This city is indeed a vibrant community.

The public schools enroll about 7,800 students in six elementary schools (grades kindergarten-Grade 6), two junior high schools (grades 7-9), and one senior high

school (grades 10-12). The school system is committed to meeting the needs of all the students. To this end, it operates an unusual range of programs and services. Support staff includes speech clinicians, nurses, social workers, psychologists, reading specialists, and guidance counselors. In addition to the services of the support staff, there are programs to meet the special needs of special children. There is a prekindergarten program, an English as a second language program, a special education program for children with handicapping conditions, an arts in education program, as well as a talented and gifted program.

Recent reorganization, whereby three elementary schools were closed, changed individual elementary school populations. Each receiving school became larger in population and the socioeconomic mix in each school changed. Six elementary schools remained open: two schools in the more affluent north end, two schools in the south side of the city, and one school in the west and one school in the middle of the city. Bussing is employed to allow for each school to be racially balanced. A unique aspect of bussing in the writer's school district is that both black and white children are bussed to attain racially balanced schools. Children from low socioeconomic

backgrounds are not the only ones bussed, the more affluent in the city are also bussed. A great deal of planning enabled the reorganization to be successful and the needs of the new school population to be met.

Author's Work Setting and Role

The writer of this practicum is an early childhood specialist and has been part of the primary unit in her school building for 21 years. The writer teaches a morning and an afternoon session of kindergarten each day. She has observed many changes in the educational system's expectations for young children. There have been changes in the ethnic and socioeconomic mix of the school's population.

The children beginning kindergarten in this school system range between 4 years 9 months and 5 years 9 months. This has remained constant. There are a growing number of kindergarteners from area preschool programs. However, not all beginning kindergarteners have had this experience. Many children beginning kindergarten in the writer's school speak a foreign language. Japanese was once the first language of a small number of children in the writer's school. Today the foreign speaking children are of South American backgrounds and Spanish is the first language of

many students entering kindergarten. The school has always had an abundant mix of children from differing socioeconomic backgrounds and those beginning kindergarten still reflect this mix. Economically, the neighborhood has changed and there are fewer children representing the high socioeconomic group while many more represent the low socioeconomic group. The racial balance in the school reflects the proportions in the city. Approximately one-third of each beginning kindergarten class is nonwhite. All the children with whom the writer works have two factors in common: curiosity and the action orientation of their being.

CHAPTER II

STUDY OF THE PROBLEM

Problem Description

Science concepts on the kindergarten level were being superficially covered. In the writer's classroom, science was integrated with other curriculum areas when the topic was appropriate. Science information was given to the children; however, it was a by-product of another curriculum area. The children were not involved in making observations and communicating their discoveries. Other curriculum areas were not integrated with science. Science was never the hub around which other curriculums revolved. This method of interjecting science into other disciplines did not provide for continuity of science topics or development of science concepts.

The science program, as it existed in the writer's classes, did not emphasize process skills like observing, inferring, classifying, and communicating. The predominant method of teaching was discussion. The discussions were teacher directed and initiated. Discussion can be a valid teaching method: however, considering the subject matter and the age of kindergarten children, a hands-on approach would be a superior method.

The natural curiosity of the children, which should be

a springboard for delving into topics, was not being tapped. The children should be involved, initiating meaningful topics, and practicing process skills.

The natural environment was not being utilized. The writer's students had access to both the seashore and woods. This natural teaching force was not being developed.

Science, at the kindergarten level, can provide a basis for learning how to learn. Science can provide the framework for children to develop process skills. Science can be a method for stimulating their natural inquisitiveness and fascination with their environment. In the writer's kindergarten classroom, the potential of the equation, science plus innate curiosity plus hands-on activity equals an integrated instructional program, was not being realized.

In conclusion, the problem in the writer's situation was that science concepts on the kindergarten level were being superficially covered.

Problem Documentation

"...and then there's science!" This statement reflected an attitude prevalent among many kindergarten teachers. Informal discussions with other professionals revealed to the writer the frustration felt by teachers who

are mandated to teach science and who do not feel they are doing the subject justice.

In order to provide documentation of the problem statement, the writer surveyed five other kindergarten teachers from her district. All considered reading and math at the primary level to be more important than science. When asked which lesson would be dropped when pressed for time (science, math, or reading) all agreed that science would be dropped. All tried to include hands-on activity in their science lessons but admitted that the predominant method usually ended up being discussion; again, time was the deciding factor. When the subject of who initiates the topic was discussed, all agreed that rarely did they use child initiated topics--most were teacher initiated.

Recently, the writer's school district has begun to recognize a need to improve science instruction. The school district has hired a science facilitator to provide teachers with support and necessary information to improve science teaching. In a recent newspaper article about the district's science program (Field, 1986), this need to improve science instruction was documented. The science facilitator stated that the thrust of the project "is to change the attitude of teachers and children toward the learning of science, to make it a stimulating, hands-on,

discovery experience instead of merely a reading lesson about concepts followed by memorization and testing" (p. 29).

These interviews and observations provided the writer with convincing evidence that the problem was indeed valid and in need of a practical solution.

Causative Analysis

In a half-day kindergarten program, time was a limiting factor. Science at the kindergarten level was not seen as having the importance of reading readiness or math instruction. Administrative and parental pressures to improve mathematics and reading scores always took precedence. Science was looked upon as another subject to be squeezed into an already full morning or afternoon. Science was usually what was left out when pressed for time.

Scheduling time for continuous development of science concepts was not given priority by teachers. Teachers, instead, tried to interject science information within other disciplines. A common example of this at the kindergarten level is reading stories about science concepts. Science was then integrated with language arts. This allowed teachers to feel that they were "teaching science" thus

fulfilling their obligation to cover science while also fulfilling the commitment to language arts. In reality, the commitment to language arts was fulfilled. Did the children learn "science"? The science concept was covered; but, without being actively involved, the children probably did not internalized the science concept and probably would not be able to apply it to future learning.

To have young children actively engaged in a science program entails using various equipment. Once again, time came into play. A kindergarten teacher trying to meet the intellectual, emotional, and social needs of 44 to 50 young children each day had little time left to gather the necessary equipment and replace the consumable items. Budget limitations came into play when dealing with equipment needs.

Why was the natural environment not used when planning science programs? Classrooms were "safe" controlled areas. Some teachers did not feel in control when using the natural environment. Also, the ratio of 1:22 was intimating when contemplating going exploring with young children.

Why was the curiosity of the children not used as a spring- board to science learning? Many teachers like to feel in control; and by initiating science topics, they retained control and thus had all the answers.

Why was discussion the predominant method of instruction rather than hands-on activity? For this there were many causes; time and equipment which were previously discussed were factors. Teachers may not have had the skills necessary for guiding inductive learning experiences. Teachers sometimes did not have hands-on lessons because the noise level went up and they equated loss of control with noise.

Related Literature

Science is a mandated subject area in all elementary, junior, and high schools. There are science curriculums issued by state education departments, and there are many textbooks published on this subject. However, school science is not producing citizens who can act decisively. Penick and Yager (1986) found that "students learn more from experiences and interactions with nonschool science than they do in the insulated and isolated science classrooms of most schools" (p.147). Science educators are concerned. Committees have been appointed to study the problem, and many reports have been written. The results of these reports point to the need to relate science instruction to day-to-day experiences of the students. Schools must also address curriculum, instructional

strategies, and evaluation techniques (Yager, 1986). Those who are critical of existing science programs call for a new focus for school science, a focus with emphasis on "helping students use their interest in and knowledge of science for living--both now and in the future" (p. 147). The citizens of tomorrow are the kindergarteners of today. They must be prepared to make decisions which affect their private lives and the welfare of the community. They must develop skills to apply knowledge to solve problems.

A comparison of the quality of curriculum between Japan and the United States indicates that science education in Japan is superior to science education in the United States.

> The Japanese did far better than students in the United States on the International Association for the Evaluation of Educational Achievement (IEA) exams. The Japanese were ranked first of 19 for 10 and 14 year olds in overall science achievement while the U.S. ranked 4th for 10 year olds and 7th for 14 year olds (Troost, 1983, p. 28).

Factors contributing to Japanese success in science education are: getting off to an early start and spending approximately one-third of the day on science that is highly experiential and includes an emphasis on developing

a positive attitude and encourages an intuitive grasp of science.

The research reviewed by the writer emphasizes the need for changes to improve science education.

Yager (1986) found that school science curriculum tends to rely on textbook learning and that this approach "decreases student interest, does not affect concept learning, and does not help or motivate students" (p.145). Science curriculum, as it exists today, is a set of knowledge and skills of the various disciplines of science packaged in textbooks (Mechling & Oliver, 1983).

Hurd (1983) found the following:

> The discipline based science courses as they are now organized promote scientific illiteracy; students are unable to identify and reasonably interpret a science/technology based personal or social problem. ...What has been missing from science courses, and is essential for scientific and technological literacy, is how to make use of information already discovered. (p.22)

Focusing on 'what' a child learns has not been successful. Today's science must take into consideration 'how' children learn. Smith (1977) applies the work of Jean Piaget to explain how children learn:

> The growth of intelligence is cumulative in that later experiences build upon earlier ones....Activities in science afford children the opportunity to develop such processes as observing, inferring, classifying, and communicating, all of which are essential for helping absorb and integrate information about the constantly changing environment....In using these intellectual processes, the child is also learning how to learn and thus is becoming truly educated. (p. 204)

Science as discovery is lacking in existing science programs. Few students carry out an experiment without already knowing what is supposed to happen (Yager, 1983). The teacher, or the text, has related what is supposed to happen. Meaningful science cannot be textbook science. The curriculum must be redesigned to integrate science and technology disciplines and encourage the development of problem-solving skills as well as the ability to communicate observations of and experiences with scientific ideas (National Science Foundation, 1983).

There is a disparity between what should be happening in elementary science classrooms and what is happening (Machling and Oliver, 1983). The goals of helping children develop the ability to solve problems and think critically are not being met (Champagne & Klopfer, 1981).

"Observations of classrooms reveal that children seldom practice these skills" (Mechling & Oliver, 1983, p.9). The National Science Foundation (1983) studies of precollege science education found that the predominant method of teaching was discussion with the textbook the source of information. The use of a textbook discourages the use of inquiry techniques (Yager, 1983).

Bredderman (1982) has shown that teaching strategies that are application and activity oriented and involve realistic problem solving produce improved results in learning content and process and in developing positive attitudes.

Bredderman compared three activity based science programs with the traditional textbook approach and concluded that children in the nontraditional classes (activity centered) outperformed those children without hands-on experience.

Wellman found that "direct first hand manipulative experiences in science enhanced the development of process skills in young children in kindergarten to 3rd grade and had a positive correlation with their success in beginning language and reading achievement" (Mechling & Oliver, 1983).

The National Science Foundation (1983) recommends that

"contacts with the community and opportunities for informal education should be fostered" (p.4). The committee found the following:

> parents and experts visiting the schools in various capacities, the students going out into the community to investigate and improve situations, to intern or observe career situations and to participate in tours arranged by museums, Audubon societies, industries, etc. would all be valuable. (p.4)

Smith (1977) has stated "most natural phenomena hold a special fascination for young children....Such realities, the subject matter of science are important to the child's real world--yet little of this "real" world is usually encountered by the child in the classroom" (p.203). A Committee report of the National Science Foundation (1983) advocates that "in grades K-6 the emphasis be on a hands-on-approach focusing on natural phenomena and problems in the child's familiar environment" (p.3). Children who have limited experience with natural phenomena in their early years in school will undoubtedly have difficulty understanding new but related phenomena in later grades (Smith, 1981). It is not the manipulation of objects in itself that is important for children's learning. What is important is the mental action that is

encouraged when children act on objects themselves (Williams & Kamii, 1986). Basic process skills, observation, predicting, classifying, and communicating applied to these experiences enable children to make sense out of these experiences and thus science becomes more meaningful to the young child.

In adolescence children are focused on themselves, their changing bodies and developing personalities (Fisher & Lazerson, 1984). Grades 7-8 provides the opportunity to stress "biological, chemical, and physical aspects of oneself as a human being and personal problems in which science and technology play a role (clothing, drugs, weight, and physical fitness, etc.)" (National Science Foundation, 1983 p.3).

"Emerging from adolescence, youths become more concerned with their role in the community, how successful they will be in the world, and what the world is like for all. It is recommended that the curriculum for grades 9-11 be structured around the interaction of science and technology with the whole society" (National Science Foundation, 1983 p.4). It is recommended that in grades 11-12 options be available for discipline orientated career preparation courses (National Science Foundation 1983).

The above outline of course content allows for the

science curriculum to be organized around problem-solving skills, real life issues, and personal and community decision making.

> Not only do students lose interest in science as they progress in school, but students also are less interested in science after a science course than they were at the beginning of the course. And students retain almost nothing of what we teach them. From elementary science to high school chemistry, the concept of the molecule is introduced and reintroduced. Yet only 25 percent of all high school graduates have a working knowledge of the molecule (Yager, 1986, p.145).

In evaluating science, teachers tend to rely on tests that emphasize facts: terms, language, and laws. Teachers continue to "test for mastery-even when it is shown that success on Friday quizzes is temporary learning. We continue to push mastery...even though the approach decreases student interest, does not affect concept learning, and does not help or motivate students" (Yager, 1986). There is little evidence that students are ever tested for their ability to use information (Yager, 1983).

Science is more than facts, concepts and laws. Science is a procedure for asking and answering questions,

a method of inquiry, a way of thinking (Mechling & Oliver, 1983). Evaluation of science must take this into consideration. The skills of science must be emphasized in science tests not just the concept or fact (National Science Foundation, 1983).

An understanding of science is required for the resolution of many of the problems of everyday life that individuals and our society encounter. These problems include air, water and soil pollution; energy resources; environmental management; health and nutrition; nuclear power; overpopulation; human organ transplants; life sustaining support systems; and safety. To make decisions on problems of this sort in the future the decision makers must have a valid understanding of science as well as the intellectual skills of decision making; the processes of organizing information to define a problem and make a decision.

This review of the literature on science in today's schools leads one to conclude that reorganization of the curriculum is a priority. The inclusion of problem-solving skills at all levels must be addressed. Science must become a procedure for inquiry, a way of thinking. Classrooms must emphasize a hands-on approach.

The literature has provided us with a better

understanding of the changes needed to improve science literacy.

From a practical standpoint science has meaning only when it is presented in a real setting. Science study must be concerned with events and objects that can be seen, considered and studied. A hands-on approach must become the mode rather than the exception in science classes. This approach must be continued throughout elementary school. Research has shown that science programs where this strategy is used are effective science programs.

Science must once again become discovery orientated. Science must become a procedure for asking and answering questions, a method of inquiry as well as a way of thinking.

The curriculum as it exists today is not meeting the needs of society. It must be reorganized taking into consideration the developmental needs of the children as well as the necessity to provide society with citizens with decision making capabilities.

CHAPTER III

ANTICIPATED OUTCOMES AND EVALUATION INSTRUMENTS

Statement of General Goals

The major goals of this practicum were: to increase the effectiveness of the kindergarten science program by providing science experiences that recognize the developmental need for children of this age to be actively engaged in the learning process, to develop the children's process skills (observing, inferring, classifying, and communicating), to utilize the natural environment, and to stimulate children's inherent curiosity.

Behavioral Expectations

The following behaviors were expected at the completion of this practicum:

1. Each child will apply the skills of observing, inferring, classifying, and communicating during science activities.

2. Each child will use his/her senses to explore and investigate the natural environment.

3. Each child will exhibit curiosity.

Standards of Performance

The following standards of performance were used to

measure behavioral expectations:

1a. Presented with stimuli for each sense, the child will draw a picture of what was seen, smelled, tasted, felt, and heard.

b. Given a bag containing an object, the child will verbally provide three clues to the group about the "mystery" object in the bag.

c. Given a specific property, e.g., small, each child will sort a group of buttons into two piles, small and not small.

d. Given a group of buttons to sort into two piles, the child will tell orally the reason why all the buttons in one pile are alike.

e. Given three new objects each child will predict those that float.

2a. When on nature walks each child will collect bits of nature and on returning to the classroom create a collage using the collection.

b. On returning from an outdoor experience each child will draw his/her responses to the following questions: What did you see?, What did you hear?, What did you smell?, and What did you feel?.

3. Each child will contribute something he/she wants to know more about, to the science corner.

Evaluation Instruments

The following assessment instruments were used to measure the standards of performance:

1. The child's response to the standard of performance was graded on a scale of 1 to 5, 1 being low and 5 being high. The standards of performance involve drawing, sorting, and verbal responses. A Process Skills Achievement Scale was completed for each child (see Appendix A).

2.a. Teacher observation assessed achievement of this standard of performance. The number of different bits of nature included in the collage indicated the child's involvement in the activity. The observation was noted on a class list and reported.

b. The number of children completing each question was tallied and reported.

3. The number of contributions of each child was tallied on a large class chart and reported.

The writer kept a log to record unexpected events that occurred during the implementation of the practicum. These events included any unexpected deviations from the original plans as well as positive and negative developments.

Plans for Analyzing Results

The results of the practicum were analyzed and are presented as follows:

1. A group analysis of the Individual Process Skills Achievement Scale was completed. Achievement was indicated by 80% of the children attaining a score of 4 or above. A table was completed to illustrate the results.

2. a. A bar graph was completed to illustrate the results of the teacher observation.

   b. A bar graph was completed to illustrate the number of children using each sense when exploring the natural environment.

3. Achievement was indicated by 80% of the children contributing at least once. The percentage of repeats was calculated and reported.

CHAPTER IV

SOLUTION STRATEGY

Discussion and Evaluation of Solutions

Keyes (1976) used a Science Open House to extend the precept that science is activity orientated. The goals of her science program were: "to identify properties of objects, to classify objects based on observed properties or on results of simple interaction experiments, and to predict and check results of simple interactions" (p.346). These goals are consistent with the major goal of this practicum: to develop the children's process skills (observing, inferring, classifying, and communicating). The goals were the basis for the activities that were organized into the Science Open House. The Open House provided parents with an opportunity to discover science beside their children and perhaps learn how to enjoy and share in the discoveries their children made through science. An event of this sort might help parents understand the importance of science in the lives of their children and ultimately the rational for making science the center of the kindergarten program. The Open House concept could be a good culminating activity for this practicum. The goals exemplify the science processes that the writer

felt were necessary to be included in an early childhood science program and which research claimed were necessary for an excellent science program.

Golden (1986) offered this strategy to teachers who felt they did not know all the answers, "Ask, don't tell....Questioning plays a critical role in inquiry which is interrelated with science teaching" (p. 1). Questioning the children about what they have actually observed helps children move from specific observations to inferences and generalizations. This strategy helps students become critical thinkers and problem solvers. This solution is applicable in an early childhood classroom. Observation is an essential process skill that young children must develop. To be able to communicate what they have observed is another process skill which the writer felt was essential to improving the quality of science concepts. This solution was in agreement with one of the major goals of this practicum and the writer agrees that this solution was applicable.

Davis (1977) claimed that a "basic aim of a science program for fives is to develop children's curiosity" (p.206). He postulated that in order to accomplish this goal science experiences should be provided using materials found in the "yard, the home and the school" (p. 208).

Included in his solution were a series of starter questions paired with an open ended activity. For example, "How do rocks differ? Encourage children to find rocks for the science center. Give the children adequate time to classify and group the rocks. Have available reference books with pictures of rocks. Find pictures of each child's birthstone. Visit a museum to observe rock collections and fossils" (Davis, 1977, p.208).

This solution took into consideration the limited time to acquire sufficient materials to engage children in a hands-on activity. Using the question to develop the children's curiosity and to involve the children in acquiring the necessary materials was a good strategy. It enabled the teacher to model an attitude of inquiry and made the children apply process skills and thus become problem solvers. This solution could be applied in the writers situation as it was aligned with the goals of the practicum.

Penick and Yager (1986) felt that science must be taken outside the classroom. They felt that the best science programs build on real world experiences and use community resources to resolve real issues and problems (1986). The writer agreed with this philosophy, however, the children impacted by this practicum were young and

egocentric, not yet involved beyond themselves and their immediate environment. A complete duplicate of this solution was not consistent with child development theory. One of the goals of this practicum was to utilize the natural environment. This concept was altered to correspond with the age level of the children involved.

Roche (1977) suggested that any solution must take into consideration child growth and development. This provides the basis for organization of the learning environment. Therefore, the selection of activities which stimulate open ended investigations ensures success for the child. Finally, Roche (1977) emphasized the importance of evaluation. The methods of evaluation must assess the extent to which the children achieve the objectives. These guidelines were applicable in the writer's situation as they encompassed many elements that were applied in the writer's immediate situation.

Mc Nay (1985) gave suggestions for including in the science curriculum the many questions young children ask. This was important to consider since one of the goals of this practicum was to stimulate the child's inherent curiosity. Curious children ask questions, sometimes at the most inopportune moment. These questions must be recognized and pursued. Mc Nay (1985) suggested a section

of the chalkboard be reserved for "A Fine Question". Then, questions may be written down to be delved into at a more opportune moment. Nc Nay further suggested guidelines in handling the questions. First, find out what children know.

Expecting children to be able to contribute to a discussion encourages and creates confidence in the child's authentic intellectual involvement, it also lessens the view of the teacher as the source of all that's important to know, and finally it promotes in the children the view that learning is something in which they themselves play an active role (Mc Nay, 1985). In considering sources of information, the child's own activity should be first. Next to be considered for answers are books or other people who may be knowledgeable (Mc Nay, 1985). This solution had many fine points to consider.

The suggestion of bringing the question back to the group was another solution that was applicable in early childhood education. Sometimes, the teacher would be surprised to learn how knowledgeable the group was and at other times it gave the teacher an opportunity to plan further activities based on the children's strengths and interests. The teacher had to be careful to encourage and

accept whatever degree of involvement was appropriate for the class she was working with.

Layton (1979) presented an outline whereby the science curriculum was used as the basis for a language experience approach to beginning reading. He felt that

> if early childhood educators... could place more emphasis on discovery and inquiry techniques and stress cognition, evaluation, as well as divergent and convergent thinking processes, then children would develop more interest in studying science and in using science as a survival tool in their daily lives (Layton, 1979, p.28).

The writer felt that this solution had merit. Using this strategy recognized the developmental needs of the kindergarten child, it developed the child's process skills, and stimulated the child's inherent curiosity through experiences. In addition, it integrated science with the language arts area in a positive way and enabled science concepts to become the catalyst for study in the language arts area.

The writer discovered a very interesting guide, Creative Environmental Education Activities for Children (1984), which incorporated environmental methods and techniques into a preschool curriculum. The activities

included in this guide were incorporated into the final solution for this practicum. Selected activities met the goal of utilizing the natural environment as well as providing for hands-on experiences through which young children learn best.

There was no simple solution to this problem. The final solution was multi faceted. All of the above strategies were quality solutions however each applied to only one aspect of the problem. Together, however, they were molded into what the writer believed provided a basis for improving the intensity of science concepts in a half-day kindergarten program.

Description of Selected Solutions

The writer recognized the importance of acquiring science skills and concepts for the young child. Research has shown the many benefits that accrue through the study of science. Science can meet children's personal needs and prepare them to live in our highly technological society. Science can help children better understand themselves and their environment. Science can help children develop thinking skills as well as stimulate their curiosity and enthusiasm for learning. The first step in the solution of this problem was acknowledging the many advantages to be

gained through science as well as the necessity to improve science instruction in the half day kindergarten.

Realistically, since this practicum was implemented for twelve weeks, the scope of science concepts was limited so as to produce intensive study. A study of the five senses initiated the science study (Abruscato, Hassard, Fossaceca, & Peck, 1980). Research has shown that children at this age level learn best when the concept involves themselves and the five senses met this criteria. Also, the five senses are the way young children learn about the world and observation, a process skill, is incorporated in a study of the five senses.

Next, two complete areas of study were encountered. One from the physical sciences, the other from the life sciences. The physical science area, emphasized the properties of size, shape, texture, color, and weight as well as the concept that the material from which an object is made affects its properties. This area emphasized the process skills of observing, inferring, classifying, and communicating.

Upon completing properties, a life science component about plants was studied. Children explored the concept of caring for plants. They planted seeds and observed the growth. In addition, they observed and compared seeds

and the many different kinds of plants.

Specific details of these areas of study are included in Appendixes B, C, and D.

The initial activity and both areas of study engaged children in hands-on activities. Research has shown that children who engage in hands-on activities achieve more, like science more, show improvement in their skills. The writer worked with the whole class (each child having their own materials) to initiate each concept in each study area. Upon completing a study area, a kit containing the materials collected to implement each study area was organized. These three study areas then formed a basis for an improved science program for next year.

A science learning corner was set up to facilitate a hands-on approach and encourage curiosity. The writer encouraged the children to contribute objects to the corner and to share them with their friends. Each Monday the writer initiated a discussion based on something brought to the table the previous week. Objects from the natural environment were chosen for this strategy. This strategy helped the writer use the interests of the children to spark curiosity in the group.

The work of Davis (1977) suggested using starter questions to initiate discussions. The work of Mc Nay

(1985) suggested bringing the wonder questions back to the group to find out what they knew and to structure further learning at the science corner that week. The writer incorporated both suggestions into the Monday morning discussion and encouraged children to add to the collection on the table. Where applicable, the writer also scheduled a walking trip and chose activities from Creative Environments Education Activities for Children (1984) to correlate with the study of the week.

On Friday mornings, the writer incorporated Layton's (1979) suggestion that science experiences lead to a language experience story. The writer led the children to write an experience story based on the activities and observations of the week. The writer felt this plan of action modeled the importance of learning about the natural environment and stimulated the children's curiosity about the world around them as well as increased their understanding of the world around them.

The solution the writer selected was consistent with the goals of this practicum. It was appropriate because it was consistent with research findings which showed that children learn best through hands-on experiences and because research showed us that young children were interested in themselves and their environment. It was

appropriate because research reports that facts are not science, inquiry through process skills is science, and it is in the application of process skills that learning takes place (Mechling & Oliver, 1983).

Report of Action Taken

The writer completed the following during implementation:

1. made a master list of all materials needed for the areas of study: the five senses, properties and the natural environment;
2. obtained all materials needed to implement hands-on activities;
3. presented five lessons on the senses (see Appendix B);
4. presented five lessons on properties (see Appendix C);
5. presented four lessons on the natural environment (see Appendix D);
6. set up a science learning center in the classroom;
7. planned for weekly child initiated study;
8. tested for achievement of performance objectives;
9. developed plans for concluding with a science open house.

The following is a calendar plan representing the action taken:

Week 1 Each day a lesson was presented focusing on one of the five senses (see Appendix B). At the end of the week all five senses had been introduced.

An area of the room was designated the science corner and the writer provided drawing materials, collections of sorting materials (old keys, bottle caps, etc.), and a magnifying glass.

The children were encouraged to bring to school something they would like to know more about. Each contribution was acknowledged and a large class tally sheet was begun. Where applicable, these items were included in the study area lessons. The children were encouraged to investigate the items on the table.

The writer realized that in order to choose an item for the following week's Child Initiated Study, feedback from the children was needed. To accomplish this, a recorder was set in place and reviewed at the end of each session. The writer was able to formulate a starter question to focus the topic, ascertain what knowledge the children had, and structure further activities for the week. During each week of implementation, the steps of Child Initiated Study (CIS), as outlined above, were

completed. The writer made no attempt to correlate the topics for CIS with the study areas. The writer did emphasize process skills throughout the CIS work as well as the study areas.

Week 2 through Week 6 The physical science area of study was focused upon. The children studied objects and their properties (see Appendix C). The process Skills Achievement Scale was completed for each child upon completion of this area of study.

Week 7 through Week 11 The natural environment was focused upon. The children used their senses in exploring plant and animal life in their immediate environment (see Appendix D). The standards of performance relating to this area of study was used to evaluate the children's achievement upon completion of this area of study.

Week 12 A Science Open House was held this week. The parents of the current kindergarteners were involved. The exhibits centered on nature, sensory exploration, and water play. In addition to classroom pets, e.g., fish, a guinea pig and a hermit crab, the children contributed stuffed animals from home. Seeds were represented in the form of a

coconut and corn on the cob as well as seeds the class collected from their various snacks (orange, grapefruit, and apple). Textures were exhibited from forays outdoors (moss, rocks, bark, and fungi). There were boxes containing nuts, pinecones, shells, and pebbles for the children to feel and guess the contents. Sounds were represented by a tape recording of sounds heard during the outdoor adventures. The children and parents were able to match cotton balls saturated with odors with pictures representing the odors. There were exhibits which emphasized water play experiences of pouring and siphoning as well as bubbles to blow and observe. Food coloring was available to provide experiences in making and mixing colored water. A tank was available for sinking and floating experiences. The open house was fun for the children as well as the parents who attended.

The action taken was comprehensive and implementation of the solution ran smoothly. It was not necessary to deviate from the selected solution although an addition was made. A portable tape recorder was left running in the science learning center to obtain feedback from the children in order to plan the weekly CIS topic. It was time consuming listening to the tape each day as there was so much irrelevant material recorded. In retrospect the

writer would suggest careful observation and interaction with the children to determine the weekly CIS topic.

CHAPTER V

RESULTS, CONCLUSIONS AND RECOMMENDATIONS

Results

It was expected that by completion of implementation children would be applying the skills of observing, inferring, classifying, and communicating during science activities. There were 44 children who participated in the group. An Individual Process Skills Achievement Scale (see Appendix A) was completed for each child and the scores were collated, by question, to present the results, as shown in Table 1. Achievement of the skill was indicated by 80% of the group receiving a score of 4 or above. Thirty-five children equal 80% of the group.

The entire group was able to make observations using their senses. They were presented with stimuli for each sense and were to draw a picture of what was seen, smelled, tasted, felt, and heard. Achievement of this skill was indicated by the entire group scoring above 4.

When tested on the ability to verbally communicate observations there were 2 children who were unable to communicate verbally although they were successful in drawing their responses. The children were asked to provide three clues which described a mystery object.

Table 1

Group Process Skills Achievement

Process Skill	Standard of Performance 1	2	3	4	5
Children who can make observations using their senses	0	0	0	14	30
Children who can communicate their observations	0	2	6	8	28
Children who can sort objects according to observed properties	6	0	0	0	38
Children who can sort and communicate their reasons for sorting objects into specific piles	6	0	0	2	36
Children who can predict objects which float	6	0	14	10	12

Twenty-eight children were able to give three clues while 8 children were able to provide only two and 6 children were able to provide only one observation. The results indicate that 36 children or over 80% were successful.

Sorting objects according to observed properties when given the property proved to be an easy task. Achievement of this skill was indicated by 38 children who successfully completed the task. There were 6 children who were unable to complete the task.

Sorting objects and communicating the reason for sorting objects into specific piles proved to be more difficult for the children. Achievement of this skill was indicated by 36 children who successfully completed the task.

Achievement was indicated for all skills except predicting. Predicting is very difficult for young children. It is beyond the cognitive abilities of most young children. Young children are very concrete and to predict, abstraction is necessary.

The writer was able to identify a small group within the larger group that needed many more experiences to develop process skills. This was an outcome the writer had not expected.

It was expected that by completion of implementation

children would be using their senses to explore and investigate the natural environment. Figure 1 indicates the involvement of the group in collecting and organizing bits of nature into a collage. This aspect of the program met much enthusiasm on the part of the children. They returned from outings with many, many bits of nature. The language exchanged within the group when describing what they had found and the organization skills used in creating the collages made this aspect of the practicum very beneficial to the children.

Figure 2 indicates the application of the senses during nature exploration. On returning to the classroom from an outdoor experience the children were asked to draw their responses to the following questions: What did you see?, What did you hear?, What did you smell?, and What did you feel?. All children in the group were successful responding to questions about feeling and seeing. Only 68% of the group could respond to the question about smelling while only 54% of the group could respond to the question about hearing.

The writer discovered that the group was relying on two of the five senses to learn about the world around them. The writer will have to add more experiences with smelling, tasting, and hearing in the future.

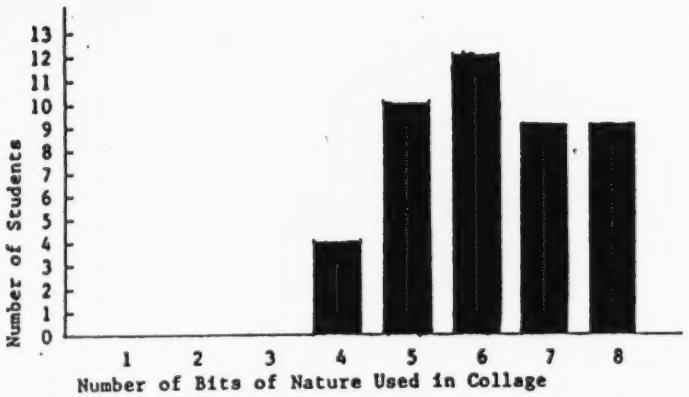

Figure 1. Children's involvement in exploring the natural environment.

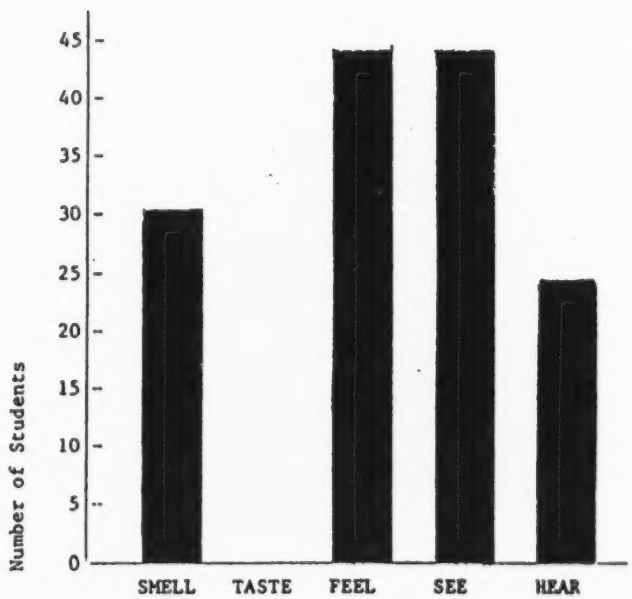

Figure 2. Application of senses during explorations of the natural environment.

The entire group contributed at least one item to the science center during the duration of the practicum (100% participation). Fifteen children were responsible for repeats with some contributing four or five times (34% repeats).

Providing the science center allowed for exploration of many different topics. Child Initiated Study was useful in developing the many different topics. The group discussed shells, rocks, fish, mountains, beaches, trees, turtles, frogs, birds, wheels, caterpillars and flowers.

Conclusions

This practicum increased the effectiveness of the kindergarten science program through the many hands-on activities and the emphasis placed on developing process skills, employing the natural environment when applicable and utilizing the children's inherent curiosity.

The emphasis given to developing process skills was beneficial to the children involved. The group could not correctly predict objects which float. There is much in the understanding of float and sink which is beyond the understanding of young children. However, their curiosity was sparked and the skill of predicting introduced, therefore, this aspect was not entirely ineffectual.

Interest in the science learning area never seemed to wane. The children were getting positive feedback from the other's interest in their contribution. Another reason for the high interest curiosity level was that the science learning area was constantly changing due to the children's contributions.

Recommendations

It is recommended that this program be continued and expanded to include parent involvement through a weekly communication suggesting activities they could share with the children. Also, it would be advisable to involve the community in providing expertise on CIS topics.

Dissemination

This practicum will be shared with other grade level professionals in the writer's school district at the next scheduled meeting. The practicum will be repeated in the writer's classroom this fall.

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APPENDIX A

INDIVIDUAL PROCESS SKILLS SCALE

Child's Name _____

STANDARD OF PERFORMANCE.....1 2 3 4 5

Child can make observations using his/her senses.....1 2 3 4 5

Child can communicate his/her observations.....1 2 3 4 5

Child can sort objects according to observed properties.....1 2 3 4 5

Child can sort and communicate his/her reasons for sorting objects into specific piles.....1 2 3 4 5

Child can predict objects which float.....1 2 3 4 5

APPENDIX B

LESSONS ON THE FIVE SENSES

THE FIVE SENSES LESSON 1

Concept Our eyes help us to see.

Objectives

Each child will name eyes as the part of the body used to see.

Each child will describe things by their color, size or shape.

Materials Needed

masks, one large colored ball, a triangle cut from colored paper, 3 pencils, one large box to hold the ball, triangle, pencils, rock, block, cup and seasonal picture

Introduction

Have the children get their masks. Have all the children pull their masks down to cover their eyes. Hold out the ball and ask: What color is the ball I am holding? Is it a large ball or a small one? When they respond that they don't know ask, "Why don't you know?" When they respond they can't see it, ask, "What part of your body do you use to see?" The response should be,"Our eyes". Tell the children, "Our eyes tell us about things". Have them remove the masks.

Development

Ask the children to look very carefully at the ball. Ask, "What do your eyes tell you about the ball?" If the

children have difficulty responding ask questions that elicit the size, color and shape of the ball. Follow the same procedure using the triangle and the pencil.

Use a seasonal picture and give the children time to observe it and try to remember it. Remove the picture from their vision and elicit details about the picture. Make a list of the responses on the chalkboard.

Use three objects (block, rock, cup)...tell the children to look carefully at the objects...ask them to pull their mask down...take away one of the objects...ask them to lift up their masks...ask them to name the missing object. What part of your body did you use to learn what object is missing? ..How do you know the 'rock' is missing? (elicit "I can't see it)...What part of your body helps you to see? Repeat this procedure with another object. Allow the child who correctly guessed the missing object to remove the next object.

Explain that our eyes help us to know about things. They tell us the color, size, and shape of things. These are important clues.

(Adapted from Abruscato, Fossaceca & Hassard, 1980, p. T-9).

THE FIVE SENSES LESSON 2

Concept Our nose helps us to smell.

Objectives

Each child will name the nose as the part of the body used to smell.

Materials

25 canisters filled with liquids, (5) vinegar,(5) water,(5) vanilla,(5) lemon juice, and cotton balls that have matching odors, Lysol spray

Introduction

Spray the front of the room and ask the children to raise their hands when they smell the odor. To elicit the part of the body used to smell ask, Can you see the smell?...Can you feel the smell?...How did you learn about the smell?

Development

Brainstorm things that smell good. Repeat the procedure for smells they don't like.

Divide the class into groups. Give each group a set of canisters and cotton balls. Direct them to match the odors. Allow the children to discover that one canister has no smell as well as one cotton ball. As they work encourage them to figure out a name for each liquid. Have them decide which smells they like and which they do not. (Adapted from Abruscato, Fossaceca & Hassard, 1980, p.T-7).

THE FIVE SENSES LESSON 3

Concept Our hands help us to feel.

Objectives

Each child will name the hands as the part of the body used for feeling.

Each child will describe things according to the texture..

Materials

sandpaper, bar of soap, cotton, a block, glue, rectangular paper (see below), marker, four bags, one containing a teflon pad, one containing marbles, one containing cotton and one containing rocks, one inch square graph paper and a mask

Introduction

To develop the vocabulary rough, smooth, hard and soft. Have a rectangular paper divided into four boxes, with one vocabulary word in each box. Hand a blindfolded child the sandpaper and elicit the word rough, glue the sandpaper to the chart where the word rough is written. Follow this procedure to elicit smooth, hard and soft.

Development

Divide the class into groups. Each group gets one bag. Each child must feel the object in the bag and the group must decide on one word to describe how it feels. The word choice will be recorded on a graph and when all four bags

have been passed around the graph will be interpreted and the word that best describes how each object felt will be matched with the object.

Elicit the part of the body we just used to decide how things feel. Ask if there are any other parts of the body that can feel and tell us an object is rough, smooth, hard or soft. Elicit the understanding that hands, fingers, feet and skin all feel.

(Adapted from Abruscato, Fossaceca & Hassard, 1980, p.T-5).

THE FIVE SENSES LESSON 4

Concept Our ears help us to hear

Objectives

Each child will name the ears as the part of the body used to hear.

Materials

Cymbals, jingle stick, masks, six sets of canisters (64),each set composed of four pairs that can be matched by sound, 18 empty soda bottles, colored water,six spoons, one inch graph paper, drawing paper, crayons, and marker

Introduction

Have children cover their eyes with the masks. Use the cymbal to illustrate a loud sound. Ask, "Can anyone tell me what made that sound?" If the children have difficulty tell them. Elicit the descriptive word, loud, to name how the sound sounded. Ask, "What did you use to hear that sound?" Follow the same procedure, using the jingle stick, to elicit the descriptive word, quiet as compared to the loud cymbal.

Development

Divide the class into groups. Give each group eight canisters of which there are four matching pairs. Tell the children to shake the canisters and find the matching pairs.

Fill soda bottles with differing levels of water. Have children tap them with a spoon to hear the different sounds. Have children order the bottles by sounds, loud to soft.

Have children draw a picture of something that makes a sound they like. Sort the pictures into loud and quiet sounds. Graph the results.

(Adapted from Abruscato, Fossaceca & Hassard, 1980, p.T-6).

THE FIVE SENSES LESSON 5

Concept Our tongue helps us to taste

Objectives

Each child will name the tongue as the part of the body used to taste.

Each child will describe things their taste: sweet, sour, salty and bitter.

Materials

one box of cotton swabs, one glass of water, sugar, salt, vinegar, sour pickle juice, magazines, glue, marker, vanilla, lemon and ginger cookies, 12 mirrors

Introduction

Give each child a cotton swab that has been dipped in water then sugar. Instruct the children to touch the swab to their tongues and describe the taste. Follow the same procedure for salt, sour pickle juice and vinegar. Elicit the words sweet, sour, bitter and salty as descriptive words. Ask, " What helped you learn about these tastes". Elicit the word tongue. Pass out mirrors for the children to examine their tongues. Explain to the children that the bumps on their tongues are called taste buds.

Development

Brainstorm all the salty foods children can remember. Follow the same procedure for sweet and sour.

Have children cut food pictures from magazines and decide which group the food belongs in, sweet, sour, salty or bitter. Glue them down to chart paper.

Prepare a tasting party for snack time. Use vanilla, lemon and gingersnap flavored cookies. Have the children categorize the tastes.

(Adapted from Abruscato, Fossaceca & Hassard, 1980, p.T-8).

APPENDIX C

LESSONS ON PROPERTIES

PROPERTIES Lesson 1

CONCEPT Collections can be organized.

Objectives

Each child will group objects according to their properties.

Materials

paper mat for each child, ziplock bag containing assorted objects for each group

Introduction

Using a group of assorted objects demonstrate sorting them by the color red. Ask for suggestions about another way to sort them and have a child sort them according to the direction. Continue this method to elicit sorting by color, shape and size.

Development

Divide the class into groups and give each group a ziplock bag full of assorted objects. Direct the children to choose objects that go together and place them on the mat. Elicit from the children the "property" used in their choice.

PROPERTIES Lesson 2

CONCEPT Color is a property of an object.

Objective

Each child will group objects according to their color.

Materials

A zip-lock bag of buttons for each child.

Introduction

Give each child a bag of buttons and direct them to sort the buttons into color piles. Elicit discussion as to the reason certain buttons are together.

Development

Give each child an additional button and elicit from him/her the pile it belongs in.

PROPERTIES Lesson 3

CONCEPT Size is a property of an object.

Objective

Each child will group objects according to the size of the object.

Materials

zip-lock bags of assorted objects, attribute blocks, rocks

Introduction

Using a set of attribute blocks separate them by size: large/small. Working with the whole class elicit the proper placement from various children.

Using a group of rocks separate them into piles by size: small/medium/large. Working with the whole class elicit the proper placement from various children.

Development

Provide children with sorting materials and group them into pairs. Direct the children to work with the objects in their bags and separate them into piles by size.

PROPERTIES Lesson 4

CONCEPT Metal, wood and plastic are materials that make up objects.

Objective

Each child will observe the properties that describe wood, metal and plastic.

Each child will classify objects by its material.

Materials

1 metal piece, 1 plastic piece, and 1 wood piece for each child. Zip-lock bags of assorted objects

Introduction

Elicit from the children and list on the chalkboard the properties of wood. Continue the same procedure for the metal and plastic pieces.

Development

The class will be divided into groups. Each group will receive a zip-lock bag of assorted objects. Direct the children to sort the objects into collections of wood pieces, plastic pieces and metal pieces.

PROPERTIES Lesson 5

CONCEPT Some objects float and others sink.

Objective

Each child will observe what happens when an object is placed into water.

Each child will share their prediction and the outcome orally.

Materials

plastic containers for water, newspapers, bags of objects, activity sheet, crayons, clay, balloons

Introduction

Children will have access to water and objects prior to the lesson. Elicit from the group definitions of sink and float.

Development

Children will receive a bag of objects and will first predict (by grouping into floaters/sinkers) and then check their predictions by placing objects, one by one, into the tank. Children will share the predictions and outcomes orally.

Students will receive a ball of clay. Students will first predict if the clay will sink or float. Students will check their prediction by dropping the clay into water.

Now they will be asked to change the shape of the clay so that it will float. The understanding of why the clay boat floats is beyond the reasoning abilities of most young children but it will, perhaps, spark their curiosity for future study and therefore will be included.

Students will receive two balloons, one filled with water and one filled with air. The students will first predict what will happen when each balloon is placed into water. Then they will test their prediction. the following questions will now be asked: What is in this balloon that makes it float? What do you think makes most things float?

APPENDIX D

LESSONS ON THE NATURAL ENVIRONMENT

THE NATURAL ENVIRONMENT LESSON 1

Concept Plants grow from seeds.

Objective

Each child will identify a seed as a living thing.

Each child will observe that seeds grow into plants.

Materials different seeds for sorting, fruits and vegetables, contact paper and index cards, plastic bags, paper towels and seeds for sprouting, knife, crayons and record sheet.

Introduction

Divide the class into groups and give each group a collection of seeds. Have the children sort the seeds into piles of like seeds. Explain that seeds are like people in that they come in different colors and sizes.

Provide a variety of fruits and vegetables that contain seeds for snack time. Cut open the fruits and vegetables, observe the seeds and discuss the fact that apple seeds produce apple trees etc. Save some of the seeds and label them for the science corner.

Development

Have children prepare seed bags and explain to them that each seed contains a baby plant and the seed bags will let us watch the plant begin to grow.

Followup

The children will observe their seed bag every day and draw what they see on a record sheet.

THE NATURAL ENVIRONMENT Lesson 2

Concept

Plants are living things.

Objective

Each child will observe plants in their environment.

Materials

chart paper, marker

Introduction

Tell a story about a seed during which all the children pretend to be the seed growing.

Development

Discuss growing. What does it mean when someone who hasn't seen you for a long time says, "My you've grown."? Elicit the fact that you have changed, you have grown, perhaps taller. Explain that if you have grown that means you are alive. Something alive grows. Go outdoors and look for things that grow.

Returning to the classroom make a list of the living things the children found.

Followup

Have a small group illustrate the chart.

THE NATURAL ENVIRONMENT Lesson 3

Concept There are many kinds of plants.

Objective

Each child will find plants in his/her own environment.

Materials

pictures of different environments and kinds of plants

Introduction

Use pictures of different environments to introduce plants with which the children would be unfamiliar.

Include a picture of plant life similiar to that which is familiar to them and have children identify the picture.

Development

Brainstorm with the children to elicit the different kinds of plants. As each is mentioned use the following:

Show the children a picture of a flower garden. Elicit from them that flowers are plants because they grow.

Show children a picture of a vegetable garden. Elicit from them that vegetables are plants because they grow.

Show children a picture of an orchard. Elicit from them that trees are plants because they grow.

Show children a picture of a lawn. Elicit from them that grass is a plant because it grows.

THE NATURAL ENVIRONMENT Lesson 4

CONCEPT Plants need sunlight, air and water to grow.

Objective

Each child will plant seeds and nuture the seedling.

Materials

seeds, stryofoam cups, planting soil, watering can and markers

Introduction

Show children two plants, one a healthy green one and one a droopy, dry plant. Have the children observe the plants and orally tell what is different.

Development

Remove the plants from the pots and have the children observe the dry dirt that falls away from the roots of the droopy plant. Have the children determine a cause for the dryness (lack of water). Ask the children where do we usually find plants? Have them determine, outside or near a window. Have them decide that the sun is outdoors and that plants need sunlight to grow.

Provide the children with materials to grow their own plant allowing them to apply what they have learned through observation and deduction to produce a healthy plant.